

Public Health Effects of Accidents in Self-employed Forestry Work

Emma Wilhelmson
Department of Silviculture
Royal Institute of Technology, KTH Syd, Sweden and
Swedish University for Agricultural Sciences

Dianne Staal Wästerlund
Department of Silviculture
Swedish University for Agricultural Sciences

Lage Burström
Department of Work and the Physical Environment
National Institute for Working Life, Sweden

Per-Olof Bylund
The Umeå Accident Analysis Group
Emergency and Disaster Medical Centre
University Hospital, Umeå, Sweden

Little is known about the extent of work-related accidents occurring during the performance of forestry work by the non-industrial private forest owner or their assistant (hereafter called self-employed NIPF). The absence of an effective accident registration system largely excludes this group from accurate representation in official statistics. In this study, data from 1996 to 2001 were collected from hospital injury records managed by the Umeå Accident Analysis Group at the University Hospital in Umeå. During that period, it was found that 485 persons in the Umeå region were given medical attention due to injuries possibly acquired during self-employed forestry work. Questionnaires about the accidents were sent to each of the 485 injured persons and 80% were returned. Responses revealed that 225 of the respondents were injured during self-employed forestry work. Out of these, 81% performed fewer than 31 days of forestry work annually. Due to the injury, 29% had been on sick leave for some period of time and 42% had persistent symptoms. On average, each injury led to 13 days of sick leave and 24 hours of institutional care. Firewood production was shown to be a key factor behind the large number of accidents for self-employed NIPF. Further studies on the lack of knowledge about how the work should be done and conscious risk taking should be considered as an important link to the development of effective accident prevention strategies.

Keywords: occupational accidents, injuries, injury registration, accident prevention, public health

INTRODUCTION

Work-related accidents cause major distress among affected employees and their families. From another perspective, the costs of these accidents are high and represent a substantial percentage of total social expenditure. Within the EU, nearly 5500 people die on the job every year and many more are injured (EUROSTAT and Dupré 2001a). Workplace accidents account annually for about €20 billion and 149 million lost workdays. During 1998, 4.7 M work accidents led to more than three days of absence from the job (EUROSTAT and Dupré 2001b). In Sweden, the number of work-related accidents has increased in recent years. In 1999, the number of occupational accidents was 4.7 per 1000 gainful employees (ASS 2000).

Sweden is covered by about 23 M ha of production forest and more than 50% is privately owned (Skogsstyrelsen 2003). As of 2000, Sweden had 354,000 non-industrial private forest owners (NIPF) who invested 53% of the total working time spent in Swedish forestry working on their forestland (Skogsstyrelsen 2003). The average age of self-employed NIPF¹ is 55; and 61% are older than 50 (Löfgren 1989). Both men and women are active as forest landowners and carry out the same types of activities. Women own about 37% of Swedish forestland (Lidestav and Nordfjell 2002). Most self-employed NIPF combine forestry with another source of income and have little or no formal forestry education (Lidestav and Nordfjell 2002).

Forestry is known as an industry with high rates of work-related injuries (Myers and Fosbroke 1994, Driscoll *et al.* 1995). For example, from 1975 to 1984, New Zealand had an average fatality rate in forestry work that was 11.5 times as high as the overall workforce rate (Cryer and Fleming 1987). Fatal accidents among self-employed NIPF account for about 75% of fatal forestry accidents annually in Sweden (Skogsstyrelsen 2003). From 1998 to 2002, 32 people died while working in Swedish forests and self-employed NIPF accounted for 25 of the 32 deaths (Carina Edgar 2004). During that period, the total time spent on small-scale forestry was 67.7 M hours (Skogsstyrelsen 2003). According to Thelin (2002), most fatal accidents among self-employed NIPF occurred while working with chainsaws during felling and stacking of trees.

There is an absence of an effective accident registration system and this largely excludes self-employed NIPF from accurate representation in official statistics of non-fatal accidents in Sweden. Self-employed NIPF do not know what reporting measures to take if an accident occurs while they are working. The lack of systematic accident reporting leads to unreliable data about accidents and injuries. Research indicates that the number of injuries and accidents among self-employed NIPF is high (Wilhelmson *et al.* 2002). Another study based on survey data reported that 60% of all injuries happened during logging, 20% during transportation and 20% during silviculture and other forestry work (Engsås 1993). Both studies however lack information on the cause of the accidents and the consequences, which is important information for accident prevention. Based on the knowledge of the high risk levels in forestry work, the significance of the time

¹ The expression 'self-employed NIPF' is used throughout this paper to refer to non-industrial forest owners and their families and employers.

that self-employed NIPF invest in Swedish forestry and the effect of accidents on public health, an urgent need for more knowledge on accidents in self-employed forestry work was identified.

The purpose of this study of self-employed NIPF has been to investigate what non-fatal incidences during forestry work lead to injuries requiring medical attention, and to obtain information about the causes of the accidents according to the injured persons as well as the consequences of the accident.

RESEARCH METHOD

Data on personal injuries were collected from 1996 to 2001 from the injury database maintained by the Umeå Accident Analysis Group at the University Hospital in Umeå, Sweden. The injury database contained 60,196 injury registrations for 1996-2001. The University Hospital's service area includes 135,000 residents and about 11,000 self-employed NIPF (Blomquist 2002). This database is coded with a 'Classification of External Causes of Injuries' (NOMESCO 1997). This coding enabled a structured search using three main criteria to determine which accidental events were caused in connection with self-employed NIPF. These criteria were the place of injury, injury mechanism and the product code. Figure 1 illustrates the selection procedure. Using this database search method, a total of 1466 injuries during the period analysed (1 January 1996 – 31 December 2001) could be discerned as possibly affecting a self-employed NIPF. The medical journals were reviewed twice to identify the cases that obviously were not related to self-employed forestry NIPF. From this investigation, it appeared that 485 individuals in the Umeå region had received medical attention for injuries that could have happened to self-employed NIPF.

In 2002 a questionnaire was sent to the 485 people identified as being potentially injured in NIPF related accidents. The purpose of the survey was to confirm whether the accident occurred during the performance of small-scale forestry work² as a self-employed NIPF, and to provide a more complete picture of what caused the accident. Responses were received from 385 people (80%). Information about the group that responded in the survey was compared with information about the group that did not respond, concerning gender, age and the seriousness of the accident. No statistical differences were found between these two populations ($p < .05$).

² The definition of small-scale forestry used in this study is: 'Forest work conducted on private forestland, managed by the owner himself or his/her assistant (family member, relative, neighbour or another person or by personnel employed by the landowner)' (Skogsstyrelsen 2003). Small-scale forestry traditionally includes all common forestry tasks, from silviculture to logging to firewood preparation. In the survey, small-scale forestry work includes silviculture, logging, firewood production, transportation, maintenance of equipment, and planning for these activities. Firewood production has not been included in earlier studies of self-employed NIPF.

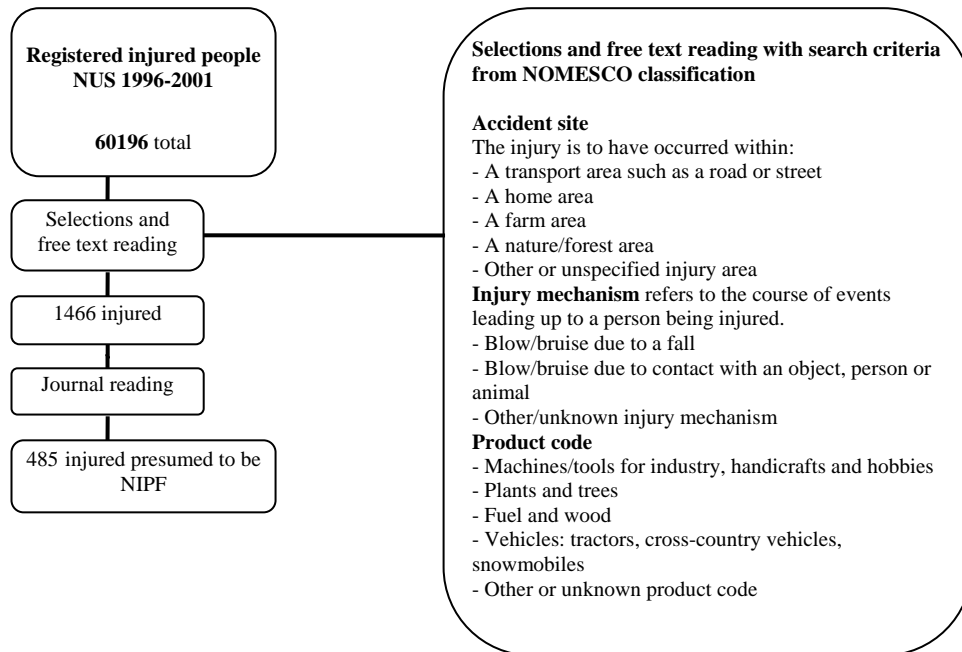


Figure 1. Illustration of the selection procedure for accident cases

RESULTS

Of the 385 responses, 225 reported that they had had an injury related to small-scale forestry work between 1996 and 2001 (Table 1). The range of injuries per year varied from 32 to 47 with a mean injury rate of approximately 40.

Table 1. Age and gender distribution of the 225 injured

Gender	Age (year)								Total
	19 or less	20-29	30-39	40-49	50-59	60-69	70-79	80-	
Men	4	20	25	37	48	40	18	4	196
Women	-	2	4	5	10	5	3	-	29
Total	4	22	29	42	58	45	21	4	225

The database includes 196 men (87%) and 29 women (13%). The average age at the time of injury was 51 for both genders. Most respondents (81%) reported workloads of 'now and then' to 'regular' (5-30 workdays/year) (Table 2). Those people whose

main source of income was forestry work were more regularly involved with small scale forestry work than other occupational groups.

Table 2. Distribution of injured based on employment and number of workdays in small-scale forestry work (%)

Workload	Relative frequency (%)	Forestry	Gainful employment	Retired	Students	Another employment
'Now and then'	40	11	44	42	20	62
Regular (5-30 workdays/year)	41	67	46	32	40	33
>30 workdays/ year	12	22	7	18	30	5
Non-respondent	8	-	3	9	10	-
Total	100	100	100	100	100	100

It was found that most injuries occurred during the month of May and the fewest injuries occurred in January (Figure 2).

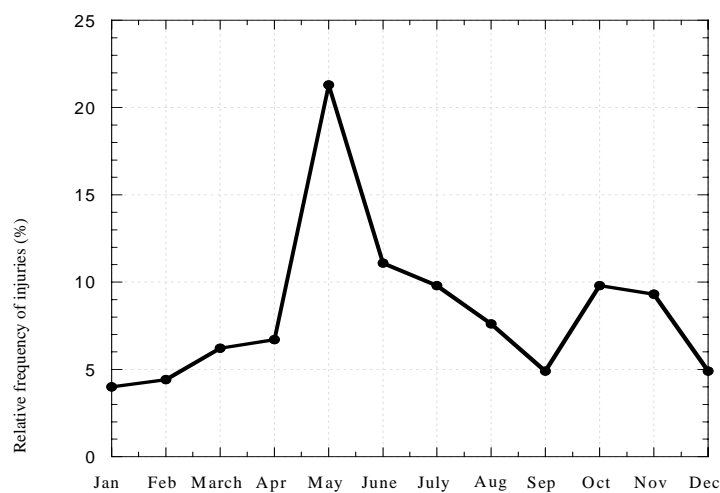


Figure 2. Distribution of injured over the year

About 54% of injuries occurred in firewood production and logging activities were responsible for 23% (Figure 3).

The question concerning which equipment or vehicle was being used at the time of injury generated 198 responses (88%). It was found that 37% had been using various kinds of wood cutting machines at the time of the accident. About 33%

reported that the main equipment involved was a chainsaw, and 11% were using an axe.

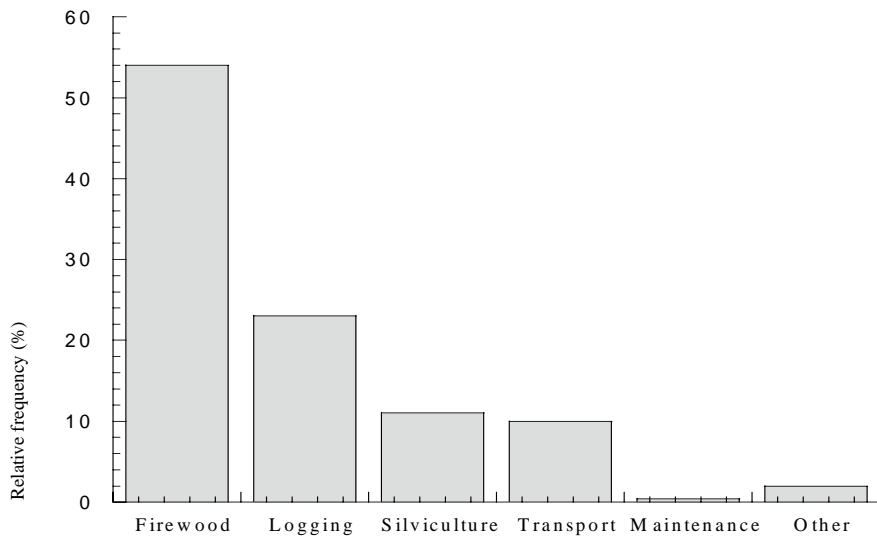


Figure 3. Distribution of injured by forestry activity

Of the 209 responses to the question ‘circumstances leading to the injury’, 68% stated personal factors as the main cause of injury and 20% reported external conditions as the main cause. Non-functional equipment, methods and vehicles accounted for 12% of injuries. Table 3 shows the equipment reported as factors in relation to the accident.

Table 3. Distribution of injured related to main cause of injury and used equipment or vehicle (n = 209)

Equipment/vehicle	Personal related factors n = 143	External conditions n = 40	Non-functional equipment/tool/method n = 26
Wood splitter	41 (79)	30 (13)	29 (8)
Circular saw	30 (66)	47 (23)	33 (11)
Axe	10 (88)	- (-)	10 (12)
Tractor	10 (68)	13 (21)	10 (11)
Snow-mobile	4 (71)	3 (14)	5 (14)
Other	4 (55)	6 (18)	14 (27)

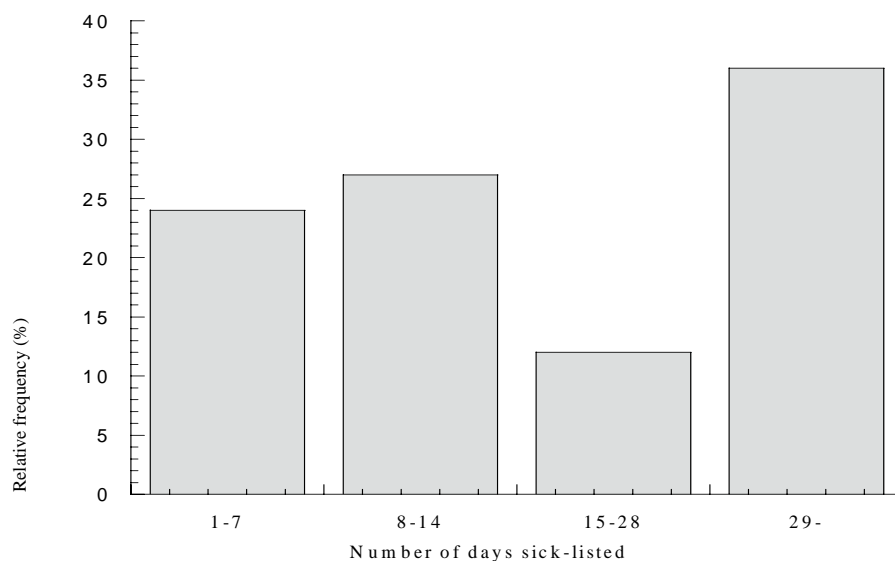
^aThe distribution of main cause of each equipment or vehicle is listed in parentheses

The medical journals revealed that most injuries occurred to the limbs (Table 4). During firewood production and timber transportation, the hands and arms were most frequently injured while during logging and silvicultural the injuries occurred most often on the legs. Most common injuries were cuts (36%) and fractures (21%). Of all 225 injured persons, 12% suffered amputation, nerve, joint or muscle injuries.

Table 4. Distribution of injuries related to the activity performed at the time of the accident and body part injured (n = 219)

Activity	Head/face	Neck	Back/chest	Hand/arm	Leg
Firewood production	12	0	1	69	18
Logging	29	6	13	17	35
Silvicultural work	21	0	8	25	46
Transportation	24	0	5	48	24

It was found that 29% of all injured persons were on sick leave for some period of time. Figure 4 shows that 36% of the injured requiring sick leave, were on sick leave for more than 29 days. In addition, 42% had persistent symptoms related to the injury. Firewood production was the cause of most of the persistent symptoms (50%). Those with long-term sick leave had a higher proportion of persistent symptoms (83%). On average, each injury led to 13 days of sick leave and 24 hours of institutional care. The University Hospital's annual costs for treating injured self-employed NIPF was estimated at SEK 730,000 (outpatient care) and SEK 1.7 M (24-hour institutional care) for a total of SEK 2.43 M.

**Figure 4.** Number of days on sick leave (self-reported)

DISCUSSION

There are problems relating to the collection of injury data in non-industrial private forestry because there is no systematic injury database. The method used in the current study (using a hospital's injury database supported by a survey) has the advantage of providing a more extended view for each case with detailed background description of the incident as well as injury consequences, than normally found in accident databases. Also, it provided additional information on the cause of the

accident which are often lacking in traditional databases based on insurance company records. However, there are some clear limitations because it contains only cases where people actively make a decision to seek medical attention at a hospital, and therefore may contain mainly cases with relatively serious injuries. The method cannot be regarded as providing reliable estimations on the quantity of accidents but rather as a method for providing qualitative information on accidents.

Most non-fatal accidents were found to occur during firewood production. According to Thelin (2002), only 1.3% of fatal forestry accidents occur during firewood production, indicating that there is a major difference between the activities leading to fatal and non-fatal accidents. Engström (1993) did not define small-scale forestry or the work elements included in his study. Since no accidents during firewood production are reported, it seems that Engström (1993) did not include firewood production in small-scale forestry work. One possible reason for this exclusion may be associated with the concept of firewood production as a 'leisure activity'. Lidestav and Nordfjell (2002) indicated however that firewood production is one of the major motives for small-scale forestry work.

As the total consumption of firewood for heating of household dwellings in Sweden is estimated at 7 M m³ stacked volume (Skogsstyrelsen 2003), it seems obvious that firewood production and the prevention of related accidents and injuries must be considered an important matter from a national public health perspective. Another aspect to take into consideration from a national public health perspective is the large number of people put on sick leave. Almost one-third of the injured had been on sick leave for their injuries for an average of 13 days, and 42% of these had persistent symptoms caused by their accident.

Circular saws and wood splitters cause a large number of injuries. These tools would benefit from safety updates and targeted training efforts to reduce accident rates. Further studies on safety updates need to be performed.

According to Reason (1995), experience and knowledge play a major role in accident risk factors. The results of this study confirm this observation, because 81% of the injured persons spent fewer than 31 days/year on small-scale forestry work.

This study is based on material from northern Norrland in Sweden in which according to Skogsstyrelsen (2003) only 13% of the forestland owned by NIPF is situated. The activity level of self-employed NIPF in this area seems to be less because they only spend 8% of their working time in small-scale forestry activities (Skogsstyrelsen 2003). Also, in that weather conditions differ between northern Norrland and the south of Sweden, the distribution of accidents over the year may be regionally influenced. Firewood is normally produced in early spring after the snow has melted.

It is generally known in psychology research that people tend to blame themselves when involved in an accident. Self-blame is a predictor of a stress syndrome appearing after an accident. Hence, this is an important strategy for effective coping (Bulman and Wortman 1977). The construction of the survey question on the cause of the accident which had three possible responses (personal factors, external conditions, non-functional equipment/tool/method) could have affected responses, because a high proportion (68%) of the injured reported personal factors as the cause of the accident. Personal factors in this case included stress, fatigue, carelessness, conscious risk-taking and lack of knowledge. Still, this category is so dominant in comparison with the response frequency of the other two

that it is worth studying further. In terms of preventive measures, it is important to consider personal factors and use them in developing strategies for prevention and training. Uwe Synwoldt at the Swedish Working Environment Authority (Arbetsmiljöverket) mentioned two possible reasons for accidents occurring in self-employed NIPF, namely a lack of knowledge about how the work should be done and conscious risk-taking (Carina Edgar 2004). Further studies on both of these reasons should be considered as an important link to the development of future effective prevention strategies.

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